

Dec. 30, 1930.

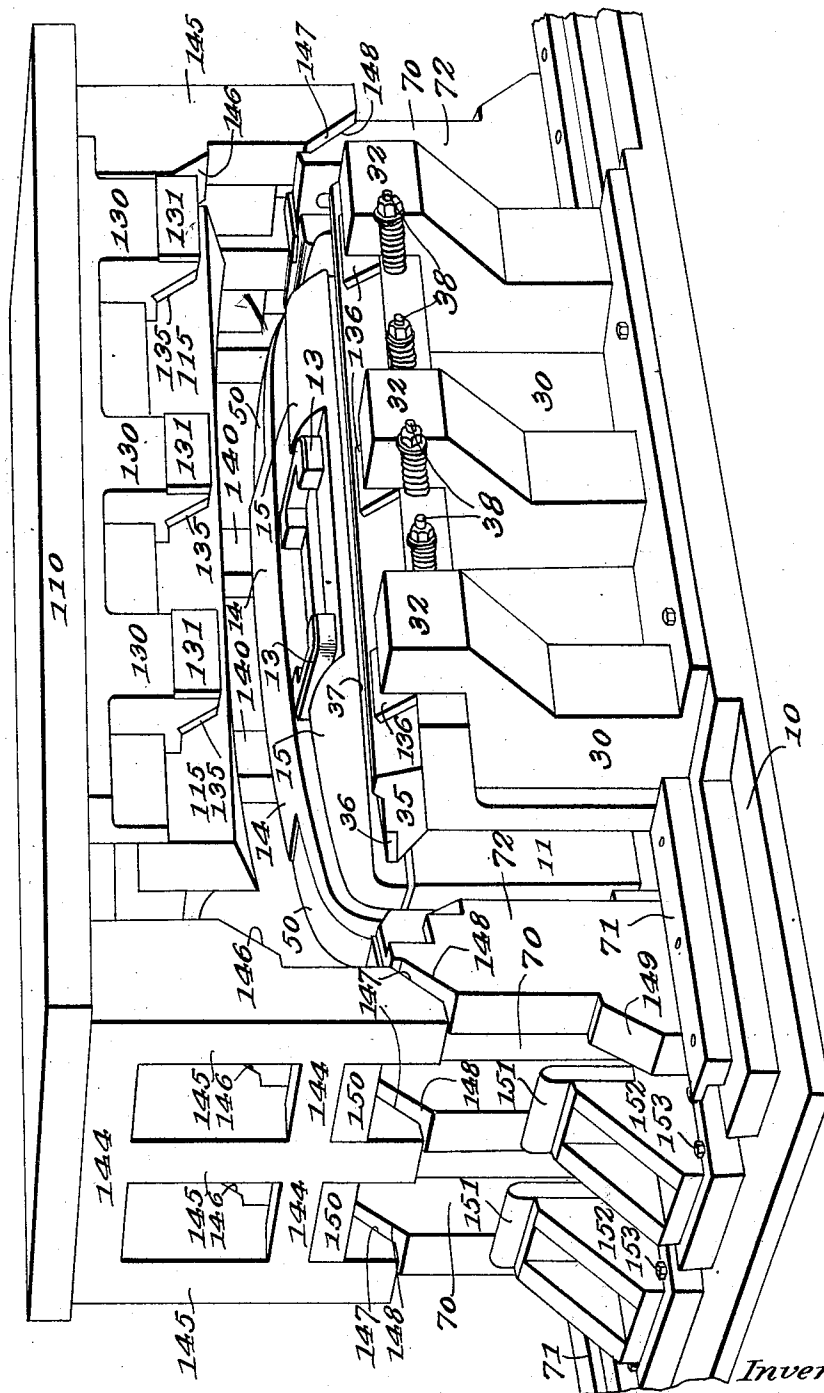
O. J. GROEHN
FLANGING BODY PANELS

1,787,151

Filed Feb. 12, 1929

6 Sheets-Sheet 1

Fig. 1



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6 Sheets-Sheet 2

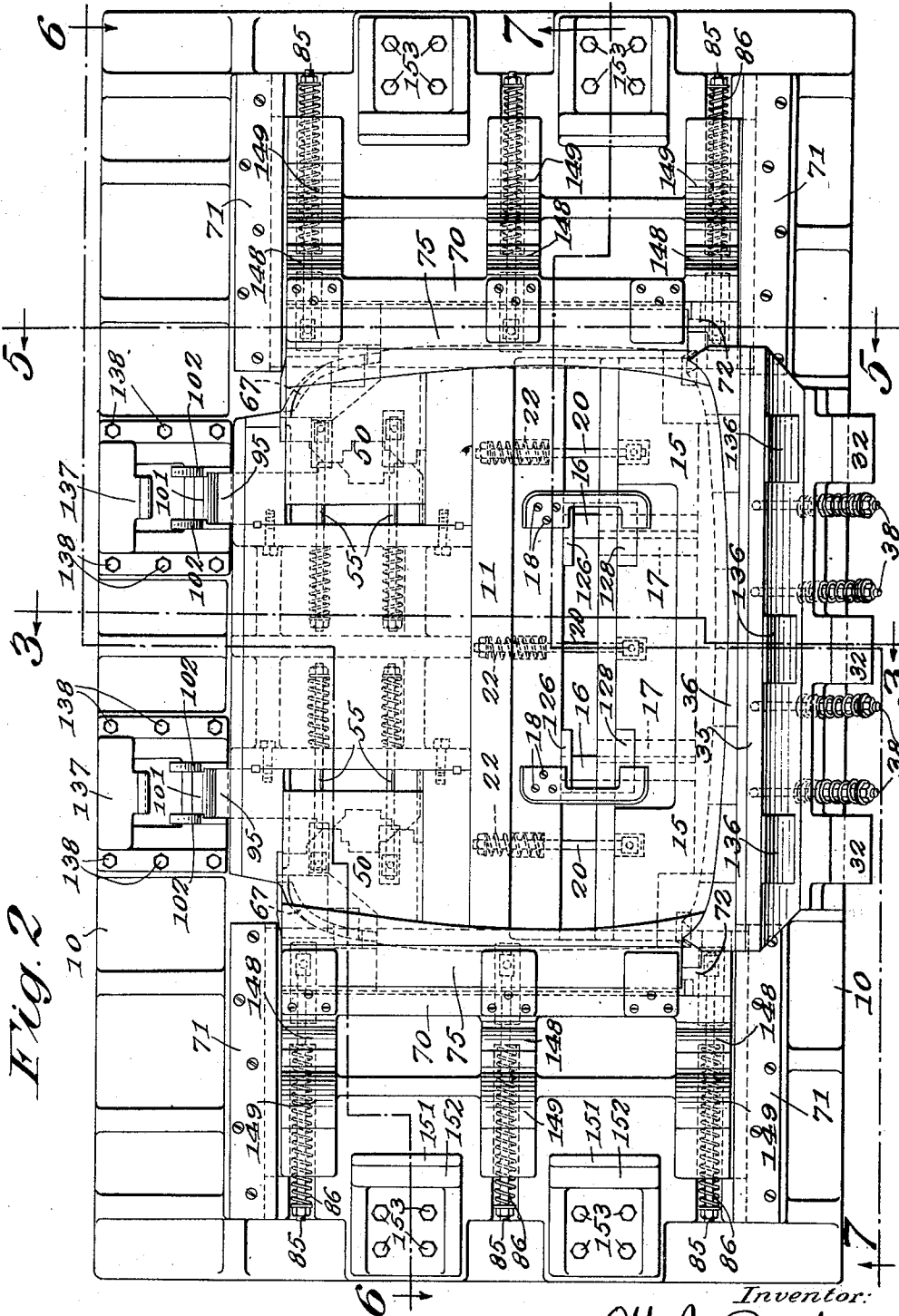


Fig. 2

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6 Sheets-Sheet 3

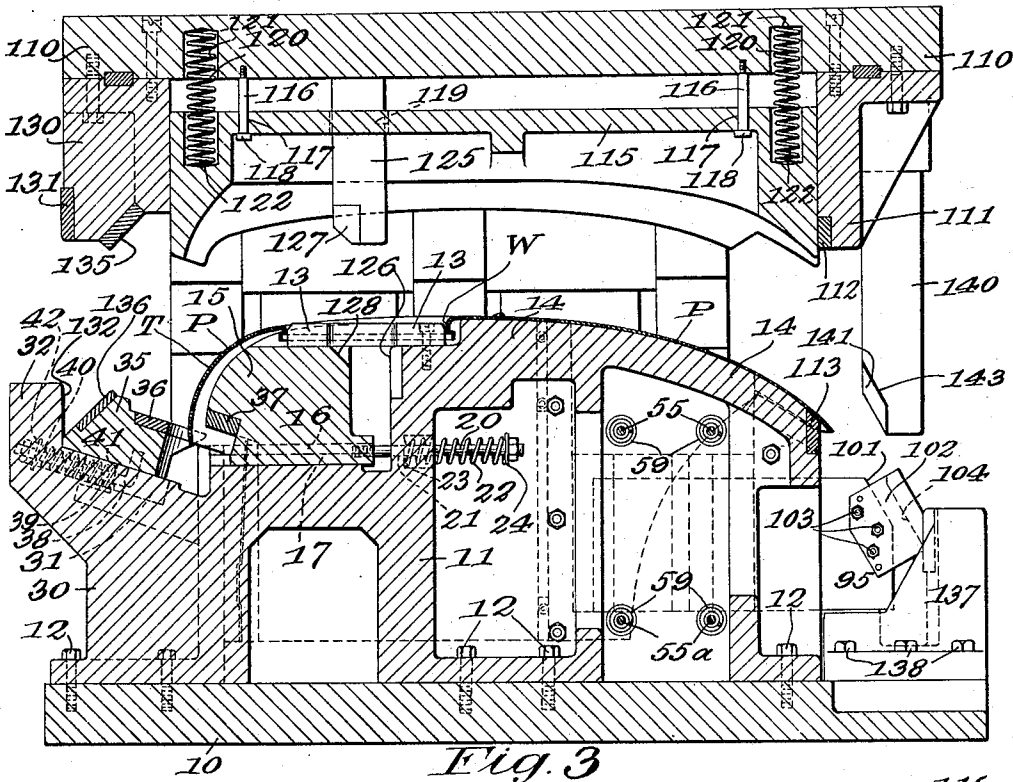


Fig. 3

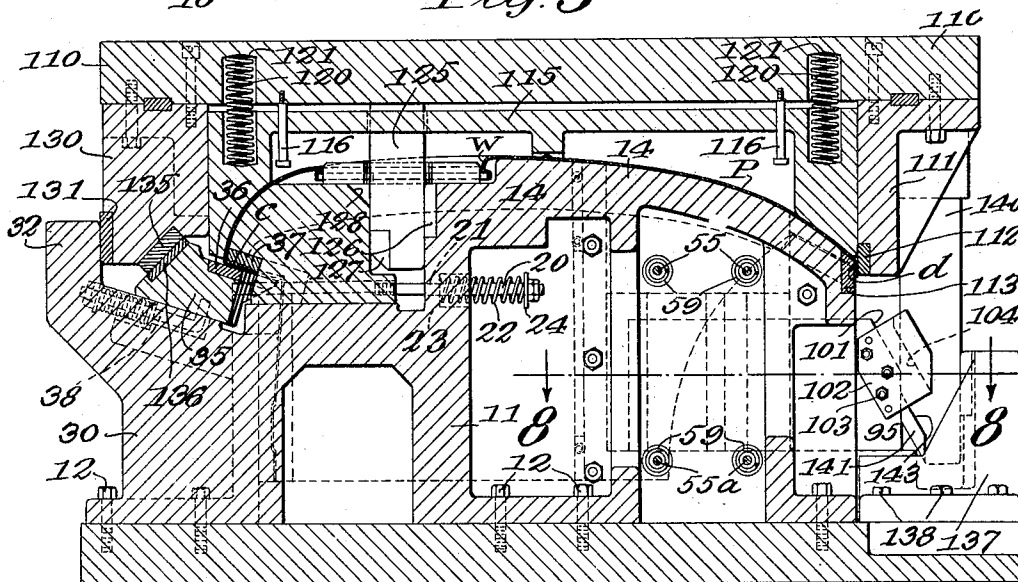


Fig. 4

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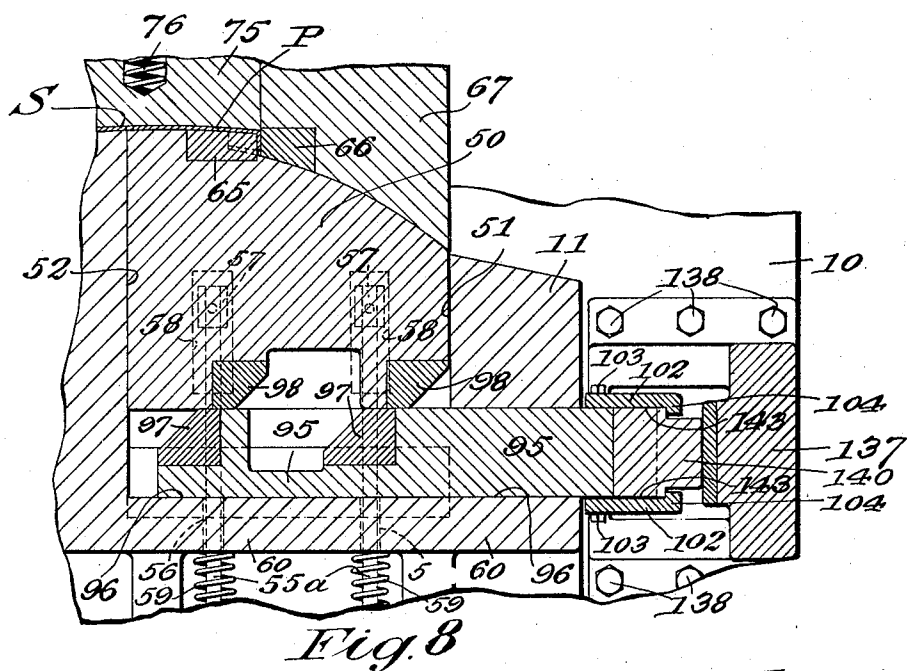
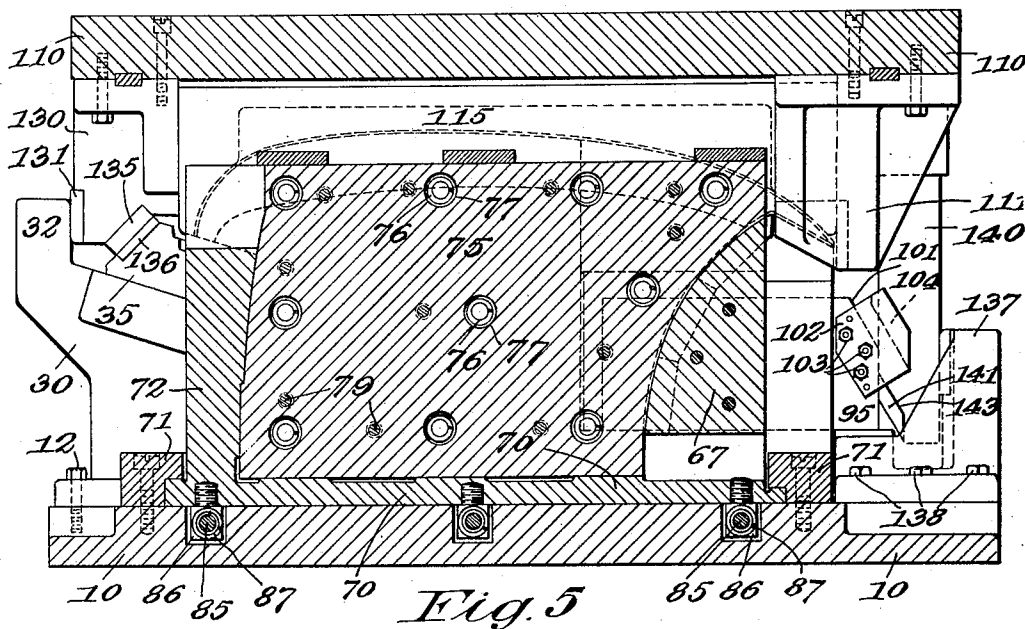
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6 Sheets-Sheet 4



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6 Sheets-Sheet 5

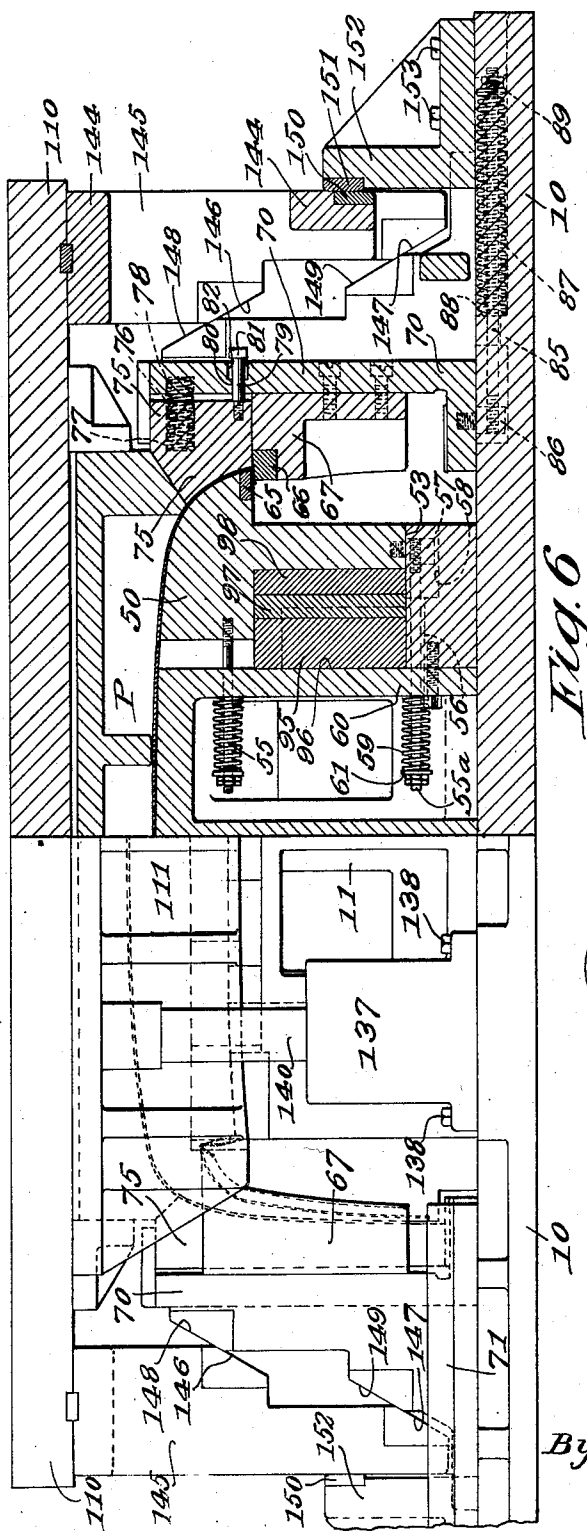


Fig. 6

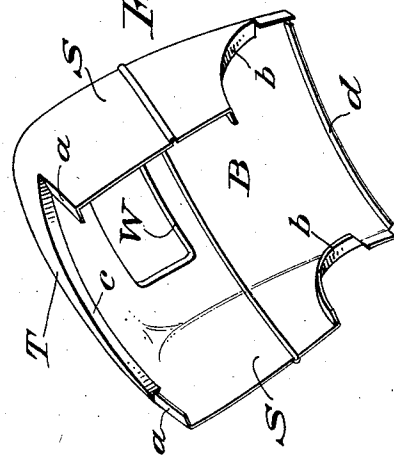


Fig. 10

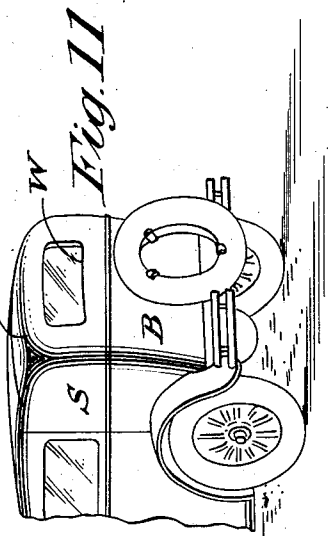


Fig. 11

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6 Sheets-Sheet 6

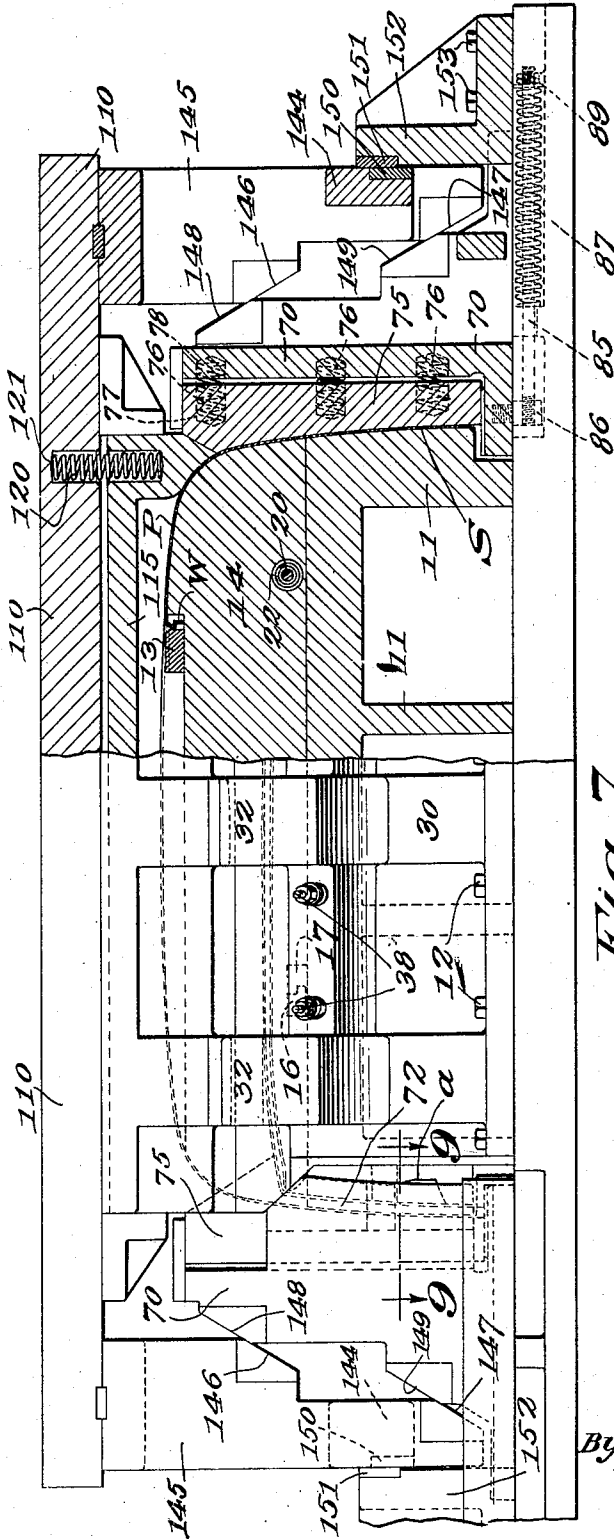


Fig. 7

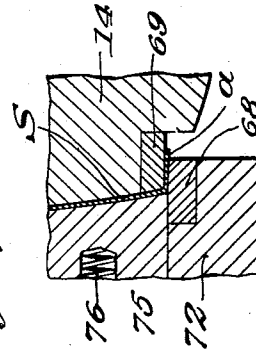


Fig. 9

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UNITED STATES PATENT OFFICE

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FLANGING BODY PANELS

Application filed February 12, 1929. Serial No. 339,364.

This invention relates especially to the manufacture of automobile bodies and more particularly relates to a method and apparatus for forming in a single operation flanges along different edges of a previously stamped sheet metal body panel; the invention being herein applied to the flanging of a back body panel comprising a back portion, forwardly extending quarter sides, a forwardly extending top, and in which a window opening has previously been formed preferably in the back part of the panel to be flanged.

The apparatus of the invention is particularly adapted for use in conjunction with the apparatus described in my co-pending applications Serial No. 276,635, filed May 10, 1928; Serial No. 319,987, filed November 16, 1928; and Serial No. 332,665, filed January 15, 1929.

In certain of these applications I have shown and described methods and apparatus for producing back panel units in a single drawing operation, whereby it is possible to stamp out or draw from sheet metal, such as sheet steel, a single panel which when finished forms a convex back portion for the automobile body as well as forwardly extending top and quarter side portions joined by upper spherical or ball corners. Prior to my inventions in the above mentioned applications this has never to my knowledge been accomplished.

For the purpose of illustration the method and apparatus is here shown in connection with the flanging of a previously drawn one-piece body panel forming the entire back of the body as well as quarter sides and forwardly extending top portions. The invention may be used, however, in conjunction with the inventions in either of my above applications, Serial Nos. 276,635 and 332,665.

After the back panel of the body has been drawn to the form and shape described in these last mentioned applications, the panel is preferably trimmed, usually at all four sides thereof, to remove surplus metal preparatory to the flanging, the latter work being shown in the present case. The trimming of the entire panel can be accomplished in a single operation in accordance with the

invention set forth in one of my above applications, as a result of which very large savings and important benefits are obtained in large scale production.

After the panel has been properly trimmed it is ready to be flanged, and an object of the present invention is to provide a method as well as an apparatus whereby all of the flanging work on an automobile body panel of the above described character, after the panel has been drawn and preferably also trimmed, may be accomplished in a single operation thereby obtaining additional economies and benefits in the production of automobile bodies on a large scale.

Although machines of various constructions have been suggested for forming upon a sheet metal blank a single flange or a plurality of flanges extending in substantially the same plane, such machines could not be used for forming the flanges upon a one-piece body panel of the character described above except by means of separate machines and in several operations, inasmuch as the flanges project from the panel in various planes. Moreover, panel flanging machines of previous types could not be employed to carry out the work required in the present instance, not only on account of the character and shape of the panel, but also because if so adapted for such work it would either be impossible to remove the panel blank from the machine or to set it into the machine.

It is a further object of the present invention to provide an apparatus adapted to form flanges on a blank extending in various planes and which is so constructed that the flanged blank may be readily removed therefrom.

Another object of the invention is to provide an apparatus adapted for forming on a blank simultaneously or in a single operation a plurality of flanges extending therefrom in various planes.

The invention will be more clearly understood from the following description in conjunction with the accompanying drawings; in which

Fig. 1 is a perspective view of an apparatus embodying the invention.

Fig. 2 is a plan view of the lower part of the apparatus shown in Fig. 1.

Figs. 3 and 4 are sectional views of the apparatus taken upon the line 3—3 indicated in Fig. 2 showing the upper die in raised and lowered positions respectively.

Fig. 5 is a sectional view of the apparatus taken upon the line 5—5 indicated in Fig. 2.

Fig. 6 is a sectional view of the apparatus taken upon the line 6—6 indicated in Fig. 2.

Fig. 7 is a sectional view of the apparatus taken upon the line 7—7 indicated in Fig. 2.

Fig. 8 is a sectional view taken upon the line 8—8 of Fig. 4.

Fig. 9 is a sectional view taken upon the line 9—9 of Fig. 7.

Fig. 10 is a perspective view of a previously shaped blank flanged in accordance with the invention; and

Fig. 11 is a perspective view of an automobile body having the flanged blank assembled therein.

Before explaining in detail the present invention, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention beyond the terms of the several claims hereto appended as considered in view of the prior art and the requirements thereof.

The invention is illustrated by way of example in the accompanying drawings by an apparatus which is particularly adapted for forming flanges upon a blank which has been previously shaped to the form and curvature of a back panel for an automobile body (Fig. 10) having a back portion B, a top portion T and quarter side portions S, the back portion B being provided with a window opening W. In accordance with the provisions of the invention a blank or stamping is shaped to provide inwardly extending flanges *a* on the top edges of the quarter side portions S, and wheel house flanges *b* near the bottom edges of the quarter side portions S, and to provide a downwardly extending flange *c* and an inwardly extending flange *d* upon the top portion T and the back portion B respectively of the blank.

A suitable apparatus for this purpose may comprise a base 10 having a support 11 extending upwardly therefrom and secured thereto as by bolts 12. The outer surface of the support 11 is shaped to receive and support a blank P of sheet metal which is to be flanged and comprises a stationary portion 14 and a movable front portion 15. The blank P is positioned accurately and centered

upon the support 11 by frame members 13 secured as by bolts 18 to the stationary portion 14 of the support and slidably engaging the movable front portion 15 and adapted to fit within the window opening W of the blank P. The movable front portion 15 is provided with suitable slides 16 adapted to cooperate with suitable slideways 17 forming a part of the support 11. Normally the movable front portion 15 is held in a position spaced inwardly from the blank by means comprising bolts 20 passing through openings 21 in the support 11 and secured to the movable front portion 15. Each of the bolts 20 is surrounded by a spring 22 positioned with one end engaging a shoulder 23 on the support 11 and with the other end engaging an abutment 24 near the free end of the bolt 20. A platform 30 extends forwardly from the support 11 and is provided with a slideway 31 inclined downwardly and inwardly towards the support 11. A plurality of projections 32 extend upwardly from the forward edge of the platform 30. A front die member 35 (Figs. 3 and 4) is mounted for movement upon the slideway 31 toward and away from the support and is provided with a suitably shaped wearing block 36 upon its inner upper edge adapted to cooperate with a wearing block 37 upon the outer lower edge of the movable front portion 15 of the support to form the flange *c* upon the top portion T of the blank. Normally the die member 35 is held outwardly or forwardly by means comprising a plurality of rods 38 passing through suitable openings 39 in the platform and secured to the die member 35. Each of the rods 38 is surrounded by a spring 40 having one end engaging a shoulder 41 on the platform 30 and its other end engaging an abutment 42 near the free end of the bolt 38.

The support 11 is also provided with movable rear side portions 50 (Figs. 2, 5, 6 and 8) mounted for movement in slideways formed by the vertical surfaces 51 and 52 and the horizontal surface 53. The movable rear side portions 50 of the support 11 are adapted to be moved outwardly to engage the inner surface of the blank to be flanged but normally are held spaced inwardly therefrom by suitable means comprising a plurality of upper bolts 55 and lower bolts 55*a* extending through suitable openings 56 in the support, the lower bolts 55*a* being secured to lugs 57 extending downwardly from the members 50 into passages 58 in the support 11 and the upper bolts 55 being secured directly to members 50. Each of the bolts 55 and 55*a* is surrounded by a spring 59 having one end engaging a web 60 of the support 11 and its other end engaging an abutment 61 near the free end of the bolt. Each of the movable rear side members 50 is provided in its outer side edge with a wearing block 65 shaped to the

desired curvature of the wheel house flange of the automobile body and is adapted to cooperate with a wearing block 66 of complementary shape formed on the projections 67 extending inwardly from one side of each of the side die members 70 movably mounted on opposite sides of the support 11 upon the base 10 in suitable guideways 71. Each of the side die members 70 is provided at its other end with an inwardly extending projection 72 having a wearing block 68 on its inner surface shaped to cooperate with a wearing block 69 of complementary shape upon the stationary portion 14 of the support 11 to form the flanges *a* (Figs. 5, 7 and 9) upon the top of the quarter side portions S of the sheet metal blank. The quarter side portions S of the blank are held against the stationary portion 14 of the support 11 by a presser foot 75 yieldably mounted upon the side die members 70 as by springs 76 extending between recesses 77 and 78 in the presser foot 75 and side die member 70 respectively. Outward movement of the presser foot 75 is limited by bolts 79 passing through suitable openings 80 in the side die members 70 and engaging the presser foot 75, each bolt 79 being provided with a head 81 adapted to engage a shoulder 82 formed upon the side die members 70.

Each of the side die members 70 is normally held outwardly away from the support by suitable means comprising a plurality of bolts 85 engaging lugs 86 depending from the die members 70 and each being surrounded by a spring 87 one end of which engages a shoulder 88 upon the base 10 and the other end engaging an abutment 89 near the end of the bolt 85.

A slide 95 is mounted in a slideway 96 in the support 11 extending to the back thereof. The slide 95 is provided near its inner end with suitable cams 97 adapted to cooperate with cams 98 upon the inner side of the rear side members 50 to move the members 50 outwardly in opposite direction to engage the inner surface of the blank. The rear end of the slide 95 extends rearwardly from the support 11 and is provided with a cam surface 101. A plate 102 is secured to the rear end of the slide 95 on either side thereof as by bolts 103 and is provided with an inwardly extending projection or cam 104 for a purpose hereinafter described.

An upper die 110 is mounted for movement towards and from the lower die or support 11 and is provided with a die member 111 which is provided upon its inner lower edge with a suitable wearing block 112 adapted to cooperate with a suitably shaped wearing block 113 on the rear upper edge of the support 11 to form the flange *d* on the back portion of the sheet metal blank. A presser foot 115 is mounted upon the upper die 110 by bolts 116 passing through openings 117 in the presser

foot and engaging the upper die 110, each of the bolts 116 being provided with a head 118 adapted to engage the lower surface of the presser foot 115 and limit its movement relative to the upper die 110. The presser foot 115 is held normally in spaced relation with the upper die 110 by springs 120 extending between recesses 121 and 122 in the presser foot and upper die respectively. One or more arms 125 depend from the upper die 110 and pass through openings 119 in the presser foot. These arms are positioned to enter a passage 126 between the stationary portion 14 and movable front portion 15 of the support terminating in the top surface of the support 11 between the frame members 13. The arms 125 are provided with a cam 127 adapted to cooperate with a cam surface 128 upon the movable front portion 15 of the support.

The upper die 110 is provided with a plurality of projections 130 depending from its front edge. Each projection 130 is provided with a wearing block 131 upon its lower outer edge adapted to engage the inner surface 132 of one of the projections 32. A cam 135 is provided upon the lower inner edge of each projection 130 adapted to engage a cam 136 upon the upper outer surface of the front die member 35. One or more arms 140 depend from the rear edge of the upper die 110 and each is provided upon its lower inner surface with a cam 141 adapted to cooperate with a cam 101 upon the outer rear edge of the slide 95. Each cam 141 is provided with a laterally extending portion providing a cam surface 143 adapted to cooperate with the cam 104 extending inwardly from the plate 102 on the slide 95. Each arm 140 is guided in its downward movement by guide blocks 137 secured upon the base 10 as by bolts 138. The upper die 110 is also provided with one or more arms 145 depending from its side edges and connected by upper and lower cross members 144 each being provided with cams 146 and 147 adapted to cooperate with cams 148 and 149 respectively upon the side die members 70. Each lower cross member 144 is provided near its lower outer edge with a wearing block 150 adapted to cooperate with a wearing block 151 upon the upper inner edge of a guide block 152 which is secured to the base 10 in any suitable manner as by bolts 153.

Operation

In carrying out the method in accordance with the above described apparatus the previously stamped blank P is placed upon the support 11 while the upper die 110 is in raised position as shown in Fig. 3, with the window opening W engaging the frame members 13. At this time the movable front portion 15 of the support 11 is held spaced inwardly from the top portion T of the blank by the springs 22 as shown in Fig. 3, and likewise the mov-

able rear side portions 50 of the support 11 are also held spaced inwardly from the blank by springs 59. So also the movable front die member 35 and the movable side die members 70 are held outwardly spaced from the support 11 by springs 40 and 87 respectively.

The upper die 110 is then moved downwardly toward the lower die or support 11 whereupon the arms 125 pass downwardly through the window opening W as well as through the corresponding opening in the window engaging frame 13. After passing through the window opening in the panel, the cams 127 on the arms 125 engage the cams 128 on the movable front portion 15 of the support or bed pad and cause the member 15 to move outwardly against the action of the springs 22 to engage and clamp the inner surface of the blank against the member 115. Likewise, the cams 141 on the arms 140 engage the cams 101 on the slides 95 and cause the latter to move inwardly thereby causing the cams 97 on the slides to engage the cams 98 on the rear side portions 50 of the support 11 to move the rear side portions outwardly to engage the inner surface of the blank and clamp it against the presser members 75 (Fig. 8). As the upper die 110 moves downwardly the presser foot 115 yieldingly engages and holds the blank P against the support 11. The die member 112 then engages the portion of the blank overhanging the die member 113 and draws the metal therebetween to form the flange *d* on the back portion B of the blank. At the same time the cams 135 and the arms 130 engage the cams 136 on the movable front die member 35 and cause the latter to move along the inclined slideway 31 and draw the portion of the blank overlapping the lower edge of the movable portion 15 of the support between the hardened blocks 36 and 37 to form the flange *c* on the top portion T of the blank. During the downward movement of the upper die 110 the cams 146 and 147 on the arms 145 engage the cams 148 and 149 upon the movable side die members 70 and cause the latter to move inwardly against the action of the springs 87 and bring the presser foot 75 against the blank to hold the latter yieldingly against the support. Thereafter during this movement the wearing block 66 on each projection 67 of the die members 70 engage the portion of the blank overlapping the movable rear side portions 50 of the support 11 and cause the metal to be drawn against the hardened block 65 on each of the rear side portions 50 of the support to form the wheel house flanges *b*. At the same time the wearing block 68 on each projection 72 of the movable die members 70 engages the portion of the blank overlapping the stationary support 14 and draws the metal against the wearing blocks 69 on opposite sides of the stationary support 14 to form the flanges *a* at the top of the quarter side portions S.

The upper die 110 is then raised whereupon the springs 40 and 22 cause the movable front die member 35 and the movable front portion 15 of the support to move outwardly and inwardly respectively away from the blank. As the upper die 110 is raised the cams 143 on the arms 140 engage the cams 104 to move the slides 95 rearwardly to bring the cams 97 and 98 into cooperative relation thereby permitting the springs 59 to draw the movable rear side portions 50 of the support 11 inwardly to their normal position out of engagement with the blank. When the upper die 110 is in its raised position the presser foot 115 is spaced above the blank and the movable front portion 15 and movable rear side portions 50 of the support 11 are retracted away from the blank thereby permitting the latter to be raised from the support and removed from the apparatus.

What I claim is:

1. An apparatus for flanging an automobile body panel having a convex back portion, forwardly extending top and side portions; which consists of means for supporting the panel with the top and side portions extending downwardly, means for clamping the inner and outer faces of said panel portions, and means for forming inwardly projecting flanges simultaneously along the edges of said top and side portions.
2. An apparatus for flanging an automobile body panel having a convex back portion, forwardly extending top and side portions, and a window opening in one of said portions; comprising in combination, a support for the panel, outwardly movable interior members for engaging inner faces of certain of said panel portions, movable exterior members for engaging outer faces thereof, inwardly movable die members for forming flanges along edges of said panel portions, and means movable through said window opening to operate one of said interior members.
3. An apparatus for flanging an automobile body panel having a convex back portion, forwardly extending top and side portions, and a window opening in one of said portions; comprising in combination a support for the panel, outwardly movable interior members for engaging inner faces of certain of said panel portions, movable exterior members for engaging outer faces thereof, inwardly movable die members for forming flanges along edges of said panel portions, and mechanism for operating all of said members simultaneously and including means movable back and forth through said window opening for shifting one of said interior members.
4. In an apparatus for shaping a sheet metal blank, in combination, a support shaped to receive said blank, said support having a stationary portion and a portion movable outwardly to engage the blank, a die

member movable towards said support and adapted to cooperate with the movable portion thereof to flange the blank, means for moving the movable portion of said support outwardly to engage the blank, and means for moving said movable die member inwardly past the movable portion of said support to flange the blank.

5. In an apparatus for shaping a sheet metal blank, in combination, a lower die having a support shaped to receive said blank, said support having a stationary portion and a portion movable outwardly to engage the blank, an upper die movable towards and away from said lower die, and means actuated by said upper die in its movement towards said lower die to move the movable portion of said support outwardly to engage the blank.

6. In an apparatus for shaping a sheet metal blank, in combination, a lower die having a support shaped to receive said blank, said support having a stationary portion and a portion movable outwardly to engage the blank, an upper die movable towards and away from the lower die, a die member movable towards said support and adapted to cooperate with the movable portion thereof to flange the blank, and means for moving the movable portion of said support outwardly to engage the blank and for moving said movable die member inwardly past the movable portion of said support to flange the blank, said means including an arm on said upper die adapted to engage one of said cooperating movable members.

7. In an apparatus for shaping a sheet metal blank, in combination, a lower die having a support shaped to receive said blank, said support having a stationary portion and a portion movable outwardly to engage the blank, an upper die movable towards and away from said lower die, a die member movable towards said support and adapted to cooperate with the movable portion of said support to flange the blank, means actuated by said upper die in its movement towards said lower die to move the movable portion of said support outwardly to engage the blank, and means for moving said movable die member inwardly past the movable portion of said support.

8. In an apparatus for shaping a sheet metal blank, in combination, a lower die having a support shaped to receive said blank, said support having a portion movable outwardly to engage the blank on the support, an upper die movable towards and away from said lower die, a slideway in said support, a slide in said slideway, cooperating cams on said slide and said movable portion of said support, and means for moving said slide during the movement of said upper die towards the lower die and thereby move said

movable portion of said support outwardly to engage the blank on said support.

9. In an apparatus for shaping a sheet metal blank, in combination, a support shaped to receive said blank, said support having a stationary portion and a portion movable outwardly to engage the blank, a die member movable towards said support and adapted to cooperate with the movable portion of said support to flange the blank, means for moving the movable portion of said support outwardly to engage the blank, means for moving said movable die member inwardly past the movable portion of said support, and means for moving said movable portion and said die member away from the blank.

10. In an apparatus for shaping a sheet metal blank having an opening therein, in combination, a support shaped to receive said blank having a stationary portion and a portion movable outward to engage the blank and inward away from the blank, means for positioning the blank on said support including a frame adapted to fit within said opening, said frame being secured to the stationary portion of said support and slidably engaging said movable portion, a die member movable towards and away from said support, and means for moving said die member and movable portion of said support.

11. In an apparatus for shaping a sheet metal blank having an opening therein, in combination, a lower die having a support shaped to receive said blank, said support having a stationary portion and a portion movable outward to engage the blank and inward away from the blank, means for positioning the blank on said support including a frame adapted to fit within said opening, said frame being secured to the stationary portion of said support and slidably engaging said movable portion, a die member movable towards and away from said support, a passage between the stationary and movable portions of said support terminating within said frame, and means for moving said die member and movable portion of said support including an upper die movable towards and away from said support and having an arm adapted to enter said passage and engage said movable portion of said support.

12. In an apparatus for shaping a sheet metal blank, in combination, a lower die having a support shaped to receive said blank, said support having a front portion and rear side portions movable towards and away from the blank on said support, an upper die movable towards and away from said lower die, and means actuated by said upper die in its movement towards the lower die for moving said rear side portions of said support in opposite directions in a plane perpendicular to the movement of said upper die while caus-

ing said front portion of said support to move in a path perpendicular to the movement of said rear side portions.

13. In an apparatus for shaping a sheet metal blank, in combination, a lower die having a support shaped to receive said blank, said support having rear side portions movable in opposite directions towards and away from the blank on said support, an upper die movable towards and away from said lower die, and means actuated by said upper die in its movement towards the lower die for moving said rear side portions of said support outwardly in opposite directions to engage said blank.

14. In an apparatus for shaping a sheet metal blank, in combination, a lower die having a support shaped to receive said blank, said support having rear side portions movable in opposite directions towards and away from the blank on said support, a slideway in said support adjacent said movable rear side portions and extending to the rear of said support, a slide in said slideway, cooperating cams on said slide and said rear side portions, and an upper die movable towards said lower die to move said slide forward and cause said rear side portions to move outwardly against said blank.

15. In an apparatus for shaping a sheet metal blank, in combination, a lower die having a support shaped to receive said blank, said support having rear side portions movable in opposite directions towards and away from the blank on said support, a slideway in said support adjacent said movable rear side portions and extending to the rear of said support, a slide in said slideway, cooperating cams on said slide and said rear side portions, and an upper die movable towards and away from said lower die, said upper die having an arm adapted to move said slide forward and cause said rear side portions to move outwardly against said blank as said upper die moves towards said lower die and to move said slide rearward as said upper die moves away from said lower die.

16. In an apparatus for shaping a sheet metal blank, in combination, a lower die having a support shaped to receive said blank, said support having a front portion movable towards and away from the blank on said support, a passage in said support adjacent said front portion extending to the top surface of said support, a front die member movable past said front portion of said support, and an upper die adapted to move said front die member inward and having an arm adapted to move into said passage and cause said front portion of said support to move outward against said blank.

17. In an apparatus for shaping a sheet metal blank, in combination, a lower die having a support shaped to receive said blank, said support having a front portion movable

towards and away from the blank on said support, a passage in said support adjacent said front portion extending to the top surface of said support, a front die member movable past said front portion of said support, an upper die adapted to move said front die member inward and having an arm adapted to move into said passage and cause said front portion of said support to move outward against said blank, and means for moving said front die member outward and for moving said front portion of said support inward.

18. In an apparatus for shaping a sheet metal blank, in combination, a lower die having a support shaped to receive said blank, said support having a front portion and rear side portions movable outwardly to engage the blank on said support, a passage in said support adjacent said front portion extending to the top surface of said support, a slideway in said support adjacent said movable rear side portions and extending to the rear of said support, a slide in said slideway, cooperating cams on said slide and said rear side portions, and an upper die movable towards said lower die to move said slide forward and cause said rear side portions to move outwardly against said blank, said upper die having an arm adapted to move into said passage and cause said front portion of said support to move outwardly against said blank.

19. In an apparatus for shaping a sheet metal blank, in combination, a lower die having a support shaped to receive said blank, said support having a front portion and rear side portions movable outwardly to engage the blank on said support, a passage in said support adjacent said front portion extending to the top surface of said support, a slideway in said support adjacent said movable rear side portions and extending to the rear of said support, a slide in said slideway, cooperating cams on said slide and said rear side portions, an upper die movable towards said lower die to move said slide forward and cause said rear side portions to move outwardly against said blank, said upper die having an arm adapted to move into said passage and cause said front portion of said support to move outwardly against said blank, die members movable towards said support, and means for moving said die members inwardly to flange the blank.

20. In an apparatus for shaping a sheet metal blank, in combination, a lower die having a support shaped to receive said blank, said support having a front portion and rear side portions movable towards and away from the blank on said support, an upper die movable towards and away from said lower die, means actuated by said upper die in its movement towards the lower die for moving said rear side portions of said sup-

port in opposite directions in a plane perpendicular to the movement of said upper die while causing said front portion of said support to move in a path perpendicular to the movement of said rear side portions, die members movable towards said support, a die member movable inward in a path inclined to said plane and adapted to cooperate with the front portion of said support to flange the blank, and means for moving said die members.

In testimony whereof I affix my signature.
OTTO J. GROEHN.